

# INTERNATIONAL SEARCH REPORT

International Application No  
PCT/EP2005/003249

## A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 F02M37/22 B01D35/143

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 F02M B01D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
|------------|---|-----------------------|
| X          | GB 1 057 855 A (CENTRE DE RECHERCHES HYDRAULIQUES ET ELECTRIQUES)<br>8 February 1967 (1967-02-08)<br>the whole document             | 1-4, 7, 9             |
| Y          | US 5 188 728 A (TRAONVOEZ ET AL)<br>23 February 1993 (1993-02-23)<br>abstract<br>column 8, line 62 - column 9, line 42;<br>figure 9 | 5, 6, 8               |
| Y          | DE 101 63 164 A1 (SIEMENS AG)<br>17 July 2003 (2003-07-17)<br>the whole document  | 5                     |
| Y          |   | 6, 8                  |

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "E" earlier document but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"A" document member of the same patent family

Date of the actual completion of the international search

16 June 2005

Date of mailing of the international search report

23/06/2005

Name and mailing address of the ISA

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Authorized officer

Van Zoest, A

## INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2005/003249

| C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT |   |                       |
|--|---|-----------------------|
| Category *   | Citation of document, with indication, where appropriate, of the relevant passages  | Relevant to claim No. |
| X  | US 5 702 592 A (SURI ET AL)<br>30 December 1997 (1997-12-30)<br>abstract<br>column 9, line 25 - column 11, line 6;<br>figures 2,3 | 1-4                   |
| A  | US 4 522 712 A (FISCHER ET AL)<br>11 June 1985 (1985-06-11)<br>abstract<br>column 7, line 5 - line 53; figures 1,6                | 1                     |

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2005/003249

| Patent document<br>cited in search report |    | Publication<br>date | Patent family<br>member(s)  | Publication<br>date  |
|---|----|---------------------|---|--|
| GB 1057855                                | A  | 08-02-1967          | FR 1345119 A<br>DE 1212042 B  | 06-12-1963<br>10-03-1966   |
| US 5188728                                | A  | 23-02-1993          | FR 2653882 A1<br>FR 2659141 A1<br>AT 132388 T<br>DE 69024637 D1<br>DE 69024637 T2<br>EP 0456781 A1<br>WO 9106357 A1 | 03-05-1991<br>06-09-1991<br>15-01-1996<br>15-02-1996<br>31-07-1997<br>21-11-1991<br>16-05-1991 |
| DE 10163164                               | A1 | 17-07-2003          | NONE  |  |
| US 5702592                                | A  | 30-12-1997          | NONE  |  |
| US 4522712                                | A  | 11-06-1985          | NONE  |  |

**Box No. VIII (ii) DECLARATION: ENTITLEMENT TO APPLY FOR AND BE GRANTED A PATENT**

*The declaration must conform to the standardized wording provided for in Section 212; see Notes to Boxes Nos. VIII, VIII (i) to (v) (in general) and the specific Notes to Box No. VIII (ii). If this Box is not used, this sheet should not be included in the request.*

Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent (Rules 4.17(ii) and 51 bis.1(a)(ii)), in a case where the declaration under Rule 4.17(iv) is not appropriate:

in relation to this international application UFI FILTERS S.P.A. is entitled to apply for and be granted a patent by virtue of the following:

UFI FILTERS S.P.A. is entitled as employer of the inventor Mr. GIRONDI Giorgio.

This declaration is made for the purposes of all designations, except the designation of the United States of America.

☐ This declaration is continued on the following sheet, "Continuation of Box No. VIII (ii)".

## PATENT COOPERATION TREATY

## PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY


(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 19 MAY 2006

WIPO

PCT

|   |  |   |                      |
|---|--|---|----------------------|
| Applicant's or agent's file reference<br>26501  | <b>FOR FURTHER ACTION</b>                                |   | See Form PCT/PEA/416 |
| International application No.<br>PCT/EP2005/003249  | International filing date (day/month/year)<br>23.03.2005 | Priority date (day/month/year)<br>09.04.2004                                |                      |
| International Patent Classification (IPC) or national classification and IPC<br>INV. F02M37/22 B01D35/143   |  |   |                      |
| Applicant<br>UFI FILTERS S.P.A. et al.  |  |   |                      |
| <p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of 5 sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> sent to the applicant and to the International Bureau) a total of 3 sheets, as follows:</p> <p><input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in Item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> |  |   |                      |
| <p>4. This report contains indications relating to the following items:</p> <p><input checked="" type="checkbox"/> Box No. I Basis of the report</p> <p><input type="checkbox"/> Box No. II Priority</p> <p><input type="checkbox"/> Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</p> <p><input type="checkbox"/> Box No. IV Lack of unity of invention</p> <p><input checked="" type="checkbox"/> Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</p> <p><input type="checkbox"/> Box No. VI Certain documents cited</p> <p><input type="checkbox"/> Box No. VII Certain defects in the international application</p> <p><input checked="" type="checkbox"/> Box No. VIII Certain observations on the international application</p>  |  |   |                      |
| Date of submission of the demand<br><br>06.02.2006  |  | Date of completion of this report<br><br>17.05.2006                         |                      |
| Name and mailing address of the international preliminary examining authority:<br> European Patent Office - P.B. 5818 Patentlaan 2<br>NL-2280 HV Rijswijk - Pays Bas<br>Tel. +31 70 340 - 2040 Tx: 31 651 epo nl<br>Fax: +31 70 340 - 3016   |  | Authorized officer<br><br>Van Zoest, A<br><br>Telephone No. +31 70 340-3796 |                      |



**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2005/003249

**Box No. I Basis of the report**

1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

|        |  |
|--------|--|
| 1, 3-6 | as originally filed                              |
| 2      | received on 08.02.2006 with letter of 06.02.2006 |

**Claims, Numbers**

|     |  |
|-----|--|
| 1-6 | received on 08.02.2006 with letter of 06.02.2006 |
|-----|--|

**Drawings, Sheets**

|          |                     |
|----------|---------------------|
| 1/2, 2/2 | as originally filed |
|----------|---------------------|

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing

3. ☐ The amendments have resulted in the cancellation of:

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/figs
- ☐ the sequence listing (*specify*):
- ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

**INTERNATIONAL PRELIMINARY REPORT  
ON PATENTABILITY**

International application No.  
PCT/EP2005/003249

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

|                               |             |     |
|-------------------------------|-------------|-----|
| Novelty (N)                   | Yes: Claims | 1-6 |
|                               | No: Claims  |     |
| Inventive step (IS)           | Yes: Claims | 1-6 |
|                               | No: Claims  |     |
| Industrial applicability (IA) | Yes: Claims | 1-6 |
|                               | No: Claims  |     |

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

Re Item V.

- 1 Newly filed claim 1 = originally filed claims 1 + 2  
Newly filed claims 2-6 = originally filed claims 3,4,7-9
2. Document D1, which is considered to represent the most relevant state of the art, discloses (the references in parenthesis applying to this document):  
*A device for indicating clogging of a filter, the filter comprising an outer casing (4) closed by a cover (11) of amagnetic material, and a filter element (1) which, together with the disc (9) to which it is connected, defines two chambers for fuel entry (5) and exit (7) respectively, and comprising a pressure sensor means (15) sensing the difference between the entry and exit fuel pressure and housed inside the filter casing, and a means for generating a signal (20) proportional to said pressure difference which is not mechanically connected to the pressure sensor means and is located outside the filter casing.*  
(see page 1, line 70- page 2, line 38; figure 1)

From this the subject-matter of independent claim 1 differs in that:  
*the pressure sensor means of the indicator device according to the invention comprises an elastically deformable element which defines a variable volume inside the fuel entry or exit chamber; a conduit which connects said volume to the other chamber; and a magnet which, associated with the flexible element, moves to follow its elongation or contraction.*

The subject matter of claim 1 is therefore novel (Art 33(2) PCT)

The problem to be solved by the present invention may be regarded as how to make the clogging indicating means more simple.

The solution to this problem proposed in claim 1 of the present application is considered as involving an inventive step (Article 33(3) PCT), because the construction and arrangement of the pressure sensor means in the fuel entry chamber of the fuel filter is not known from nor rendered obvious by the available prior art.



**INTERNATIONAL PRELIMINARY  
REPORT ON PATENTABILITY  
(SEPARATE SHEET)**

International application No.

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3. Claims 2-6 are dependent on claim 1 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

**Re Item VIII.**

1. The application does not meet the requirements of Article 6 PCT, because claim 1 is not clear. The reasons for this being as follows:

Although claim 1 relates to a device indicating clogging, it seeks to define the invention by reference to features of another device (i.e. a fuel filter) for which it has to be used. This results in a lack of clarity (Art. 6 PCT).

2. In order to solve this lack of clarity claim 1 and the dependent claims 2-6 should be directed to a fuel filter with a device for indicating clogging.

Based on the observation that the fuel pressure difference between the filter inlet and outlet is a quantity related, to a sufficiently reliable and significant extent, to the degree of clogging of the filter, said devices activate indicator means when a limiting value of said pressure difference is exceeded.

Said devices, e.g. disclosed in GB-A-1057855, generally comprise a cylindrical chamber and a piston slidable in its interior to divide it into two half-chambers, of which one communicates with the fuel inlet and the other with the fuel outlet. Said chamber, which can be provided directly within the filter casing or within a separate container, also houses a spring means acting on the piston against the action of the pressure difference, and an electromechanical or electromagnetic switch providing a signal as the result of a movement of said piston against the action of the spring.

The described device is mounted in suitable seats provided in the filter casing and fixed thereto by known means by way of suitable seal gaskets.

However this configuration presents certain drawbacks: firstly, problems in sealing the filter against the external environment inevitably arise at the fixing between the seat and the device; in addition, the provision of said seats considerably complicates construction, while the presence of the gaskets makes it more difficult to mount and replace the device. Finally, these factors also produce a cost increase that cannot be ignored.

#### DISCLOSURE OF THE INVENTION

The object of the present invention is to overcome the stated drawbacks within the context of a simple, rational and low-cost solution.

The invention attains said object by virtue of the characteristics indicated

## CLAIMS

1. A device for indicating clogging of the fuel filter of internal combustion engines, in particular diesel engines, the filter comprising an outer casing closed by a cover of amagnetic material, and a filter element which, together with the disc to which it is connected, defines two chambers for fuel entry and exit respectively, comprising a pressure sensor means sensing the difference between the entry and exit fuel pressure and housed inside the filter casing, and a means for generating a signal proportional to said pressure difference which is not mechanically connected to the pressure sensor means and is located outside the filter casing, characterised in that the pressure sensor means comprises an elastically deformable element which defines a variable volume inside the fuel entry or exit chamber; a conduit which connects said volume to the other chamber; and a magnet which, associated with the flexible element, moves to follow its elongation or contraction.
2. An indicator device as claimed in claim 1, characterised in that said pressure sensor means is housed in the fuel entry chamber.
3. An indicator device as claimed in claim 1, characterised in that said elastically deformable element is fixed, by known means, to the filter cartridge connection disc.
4. An indicator device as claimed in claim 1, characterised in that said conduit is a through hole passing through the thickness of the filter cartridge connection disc, in correspondence with the flexible element.
5. An indicator device as claimed in claim 1, characterised in that said

signal generating means comprise:

a Hall sensor sensitive to the magnetic field of the magnet of the pressure sensor means, and a processor for processing the voltage signal generated by the Hall sensor.

6. An indicator device as claimed in claim 1, characterised in that the signal generating means is positioned on the filter cover.

# PATENT COOPERATION TREATY

REC'D 22 JUN 2005

WIPO

PCT

From the  
INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

see form PCT/ISA/220

## WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY (PCT Rule 43bis.1)

Date of mailing  
(day/month/year) see form PCT/ISA/210 (second sheet)

Applicant's or agent's file reference  
see form PCT/ISA/220

**FOR FURTHER ACTION**  
See paragraph 2 below

International application No.  
PCT/EP2005/003249

International filing date (day/month/year)  
23.03.2005

Priority date (day/month/year)  
09.04.2004

International Patent Classification (IPC) or both national classification and IPC  
F02M37/22, B01D35/143

Applicant  
UFI FILTERS S.P.A.

**1. This opinion contains indications relating to the following items:**

- ☒ Box No. I Basis of the opinion
- ☐ Box No. II Priority
- ☐ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☐ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

**2. FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

**3. For further details, see notes to Form PCT/ISA/220.**

Name and mailing address of the ISA:



European Patent Office - P.B. 5818 Patentlaan 2  
NL-2280 HV Rijswijk - Pays Bas  
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Van Zoest, A

Telephone No. +31 70 340-3796



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2005/003249

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**Box No. I Basis of the opinion**

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1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
  - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
  - a. type of material:
    - ☐ a sequence listing
    - ☐ table(s) related to the sequence listing
  - b. format of material:
    - ☐ in written format
    - ☐ in computer readable form
  - c. time of filing/furnishing:
    - ☐ contained in the international application as filed.
    - ☐ filed together with the international application in computer readable form.
    - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING AUTHORITY**

International application No.  
PCT/EP2005/003249

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**Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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**1. Statement**

|                               |             |         |
|-------------------------------|-------------|---------|
| Novelty (N)                   | Yes: Claims | 5 6 8   |
|                               | No: Claims  | 1-4,7,9 |
| Inventive step (IS)           | Yes: Claims |         |
|                               | No: Claims  | 1-9     |
| Industrial applicability (IA) | Yes: Claims | 1-9     |
|                               | No: Claims  |         |

**2. Citations and explanations**

**see separate sheet**

Re Item V.

- 1 Reference is made to the following documents:

D1 : GB-A-1.057.855                      D3 : US-A-5.188.728  
D2 : US-A-5.702.592                      D4 : DE-A-101.63.164

2 INDEPENDENT CLAIM 1

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT.

Document D1 discloses (the references in parentheses applying to this document):

*A device for indicating clogging of a filter, the filter comprising an outer casing (4) closed by a cover (11) of amagnetic material, and a filter element (1) which, together with the disc (9) to which it is connected, defines two chambers for fuel entry (5) and exit (7) respectively, and comprising a pressure sensor means (15) sensing the difference between the entry and exit fuel pressure and housed inside the filter casing, and a means for generating a signal (20) proportional to said pressure difference which is not mechanically connected to the pressure sensor means and is located outside the filter casing. (see page 1, line 70- page 2, line 38; figure 1)*

This device is also suitable for indicating clogging of fuel filters for internal combustion engines. The subject matter of claim 1 is therefore not new.

The above subject matter is also disclosed by the document D4.

3 DEPENDENT CLAIMS 2-9

Dependent claims 2-9 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty and/or inventive step (Article 33(2) and (3) PCT).

The reasons for this being as follows:

For claims 2-4 : see document D1 or D2

For claims 7,9 : see document D1

For claim 5 : see document D3



**WRITTEN OPINION OF THE  
INTERNATIONAL SEARCHING  
AUTHORITY (SEPARATE SHEET)**

International application No.

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For claims 6,8 : see document D4